

MITSUBISHI IGBT MODULES  
**CM400DY-24A**

HIGH POWER SWITCHING USE

**CM400DY-24A**



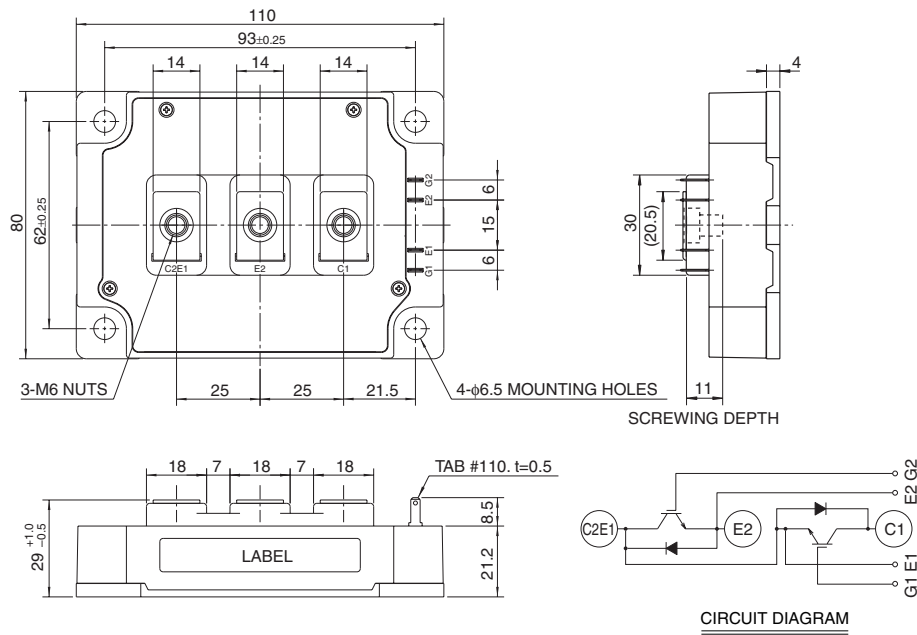
- IC ..... 400A
- VCES ..... 1200V
- Insulated Type
- 2-elements in a pack

**APPLICATION**

AC drive inverters & Servo controls, etc

**OUTLINE DRAWING & CIRCUIT DIAGRAM**

Dimensions in mm



ABSOLUTE MAXIMUM RATINGS (T<sub>j</sub> = 25°C, unless otherwise specified)

| Symbol                   | Parameter                     | Conditions                                     | Ratings    | Unit             |
|--------------------------|-------------------------------|--|------------|------------------|
| V <sub>CE</sub> S        | Collector-emitter voltage     | G-E Short                                      | 1200       | V                |
| V <sub>GE</sub> S        | Gate-emitter voltage          | C-E Short                                      | ±20        | V                |
| I <sub>C</sub>           | Collector current             | DC, T <sub>C</sub> = 85°C <sup>*1</sup>        | 400        | A                |
| I <sub>CM</sub>          |                               | Pulse (Note 2)                                 | 800        |                  |
| I <sub>E</sub> (Note 1)  | Emitter current               |  | 400        | A                |
| I <sub>EM</sub> (Note 1) |                               | Pulse (Note 2)                                 | 800        |                  |
| P <sub>C</sub> (Note 3)  | Maximum collector dissipation | T <sub>C</sub> = 25°C <sup>*1</sup>            | 2710       | W                |
| T <sub>j</sub>           | Junction temperature          |  | -40 ~ +150 | °C               |
| T <sub>stg</sub>         | Storage temperature           |  | -40 ~ +125 | °C               |
| V <sub>iso</sub>         | Isolation voltage             | Terminals to base plate, f = 60Hz, AC 1 minute | 2500       | V <sub>rms</sub> |
| —                        | Torque strength               | Main terminals M6 screw                        | 3.5 ~ 4.5  | N • m            |
| —                        |                               | Mounting M6 screw                              | 3.5 ~ 4.5  |                  |
| —                        | Weight                        | Typical value                                  | 580        | g                |

ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C, unless otherwise specified)

| Symbol                   | Parameter                            | Test conditions  | Limits |      |       | Unit |
|--------------------------|--------------------------------------|--|--------|------|-------|------|
|                          |                                      |  | Min.   | Typ. | Max.  |      |
| I <sub>CE</sub> S        | Collector cutoff current             | V <sub>CE</sub> = V <sub>CE</sub> S, V <sub>GE</sub> = 0V  | —      | —    | 1     | mA   |
| V <sub>GE(th)</sub>      | Gate-emitter threshold voltage       | I <sub>C</sub> = 40mA, V <sub>CE</sub> = 10V   | 6      | 7    | 8     | V    |
| I <sub>GE</sub> S        | Gate leakage current                 | ±V <sub>GE</sub> = V <sub>GE</sub> S, V <sub>CE</sub> = 0V   | —      | —    | 0.5   | μA   |
| V <sub>CE(sat)</sub>     | Collector-emitter saturation voltage | I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V   |        |      |       | V    |
|                          |                                      | T <sub>j</sub> = 25°C  | —      | 2.1  | 3.0   |      |
|                          |                                      | T <sub>j</sub> = 125°C   | —      | 2.4  | —     |      |
| C <sub>ies</sub>         | Input capacitance                    | V <sub>CE</sub> = 10V<br>V <sub>GE</sub> = 0V  | —      | —    | 70    | nF   |
| C <sub>oes</sub>         | Output capacitance                   |  | —      | —    | 6     |      |
| C <sub>res</sub>         | Reverse transfer capacitance         |  | —      | —    | 1.4   |      |
| Q <sub>G</sub>           | Total gate charge                    | V <sub>CC</sub> = 600V, I <sub>C</sub> = 400A, V <sub>GE</sub> = 15V   | —      | 2000 | —     | nC   |
| t <sub>d(on)</sub>       | Turn-on delay time                   | V <sub>CC</sub> = 600V, I <sub>C</sub> = 400A<br>V <sub>GE</sub> = ±15V<br>R <sub>G</sub> = 0.78Ω, Inductive load<br>I <sub>E</sub> = 400A | —      | —    | 550   | ns   |
| t <sub>r</sub>           | Turn-on rise time                    |  | —      | —    | 180   |      |
| t <sub>d(off)</sub>      | Turn-off delay time                  |  | —      | —    | 600   |      |
| t <sub>f</sub>           | Turn-off fall time                   |  | —      | —    | 350   |      |
| t <sub>rr</sub> (Note 1) | Reverse recovery time                |  | —      | —    | 250   |      |
| Q <sub>rr</sub> (Note 1) | Reverse recovery charge              |  | —      | 16   | —     |      |
| V <sub>EC</sub> (Note 1) | Emitter-collector voltage            | I <sub>E</sub> = 400A, V <sub>GE</sub> = 0V  | —      | —    | 3.8   | V    |
| R <sub>th(j-c)Q</sub>    | Thermal resistance                   | IGBT part (1/2 module) <sup>*1</sup>   | —      | —    | 0.046 | K/W  |
| R <sub>th(j-c)R</sub>    |                                      | FWDi part (1/2 module) <sup>*1</sup>   | —      | —    | 0.085 |      |
| R <sub>th(c-f)</sub>     | Contact thermal resistance           | Case to heat sink, Thermal compound Applied (1/2 module) <sup>*2</sup>   | —      | 0.02 | —     |      |
| R <sub>G</sub>           | External gate resistance             |  | 0.78   | —    | 10    | Ω    |

\*1 : Case temperature (T<sub>C</sub>), heat sink temperature (T<sub>i</sub>) measured point is just under the chips.

\*2 : Typical value is measured by using thermally conductive grease of λ = 0.9[W/(m • K)].

Note 1. I<sub>E</sub>, V<sub>EC</sub>, t<sub>rr</sub> & Q<sub>rr</sub> represent characteristics of the anti-parallel, emitter-collector free-wheel diode (FWDi).

2. Pulse width and repetition rate should be such that the device junction temperature (T<sub>j</sub>) does not exceed T<sub>jmax</sub> rating.

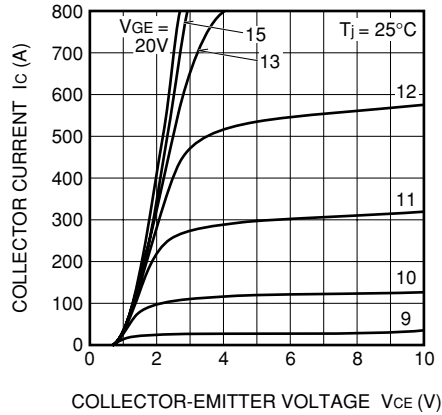
3. Junction temperature (T<sub>j</sub>) should not increase beyond 150°C.

# CM400DY-24A

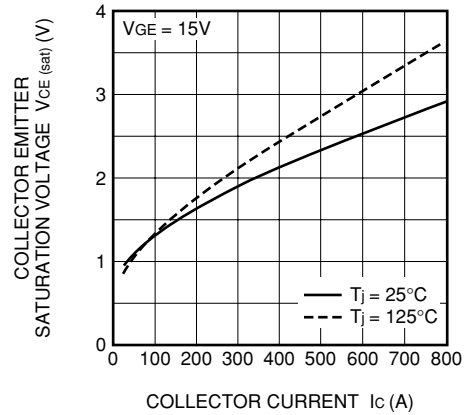
## HIGH POWER SWITCHING USE

### PERFORMANCE CURVES

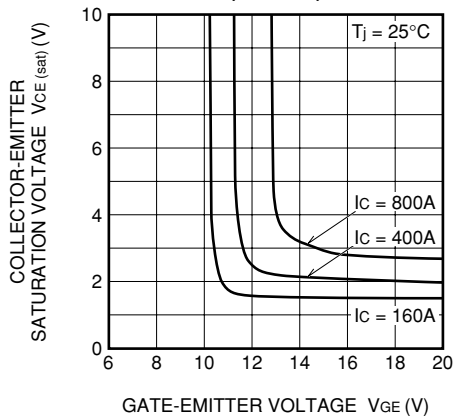
**OUTPUT CHARACTERISTICS (TYPICAL)**



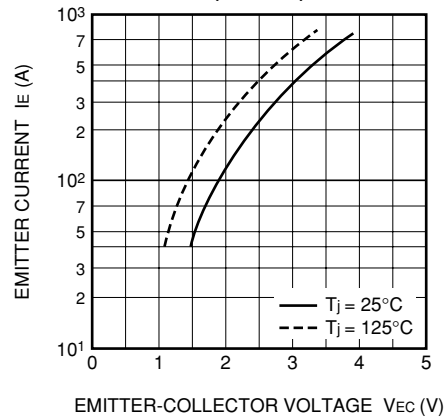
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



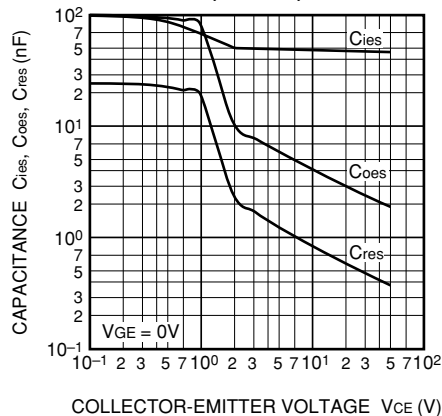
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**



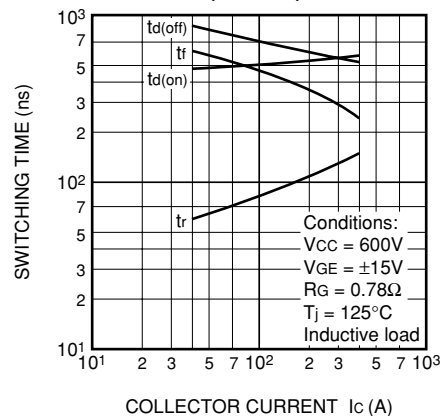
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



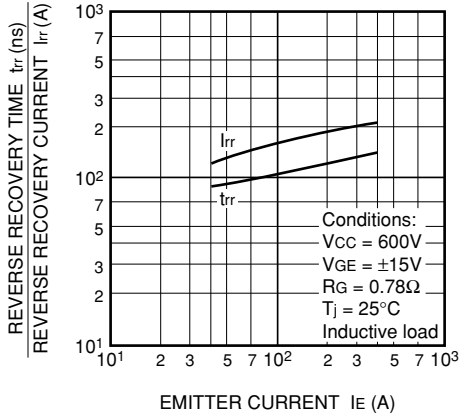
**CAPACITANCE-Vce CHARACTERISTICS (TYPICAL)**



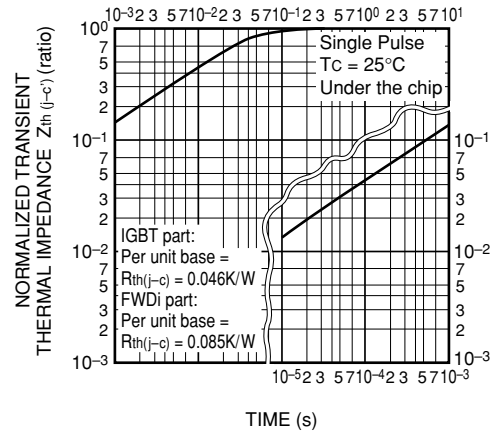
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



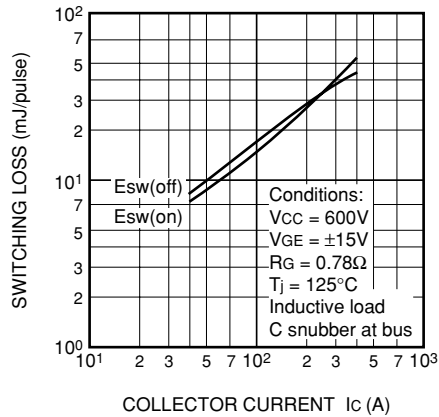
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



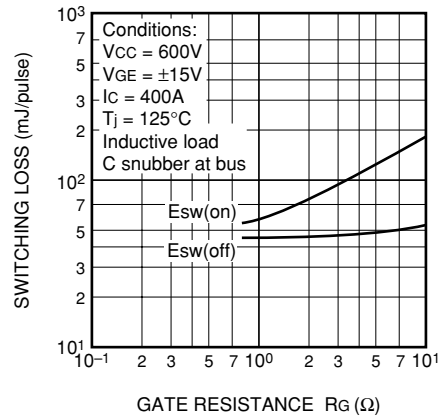
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT part & FWDi part)



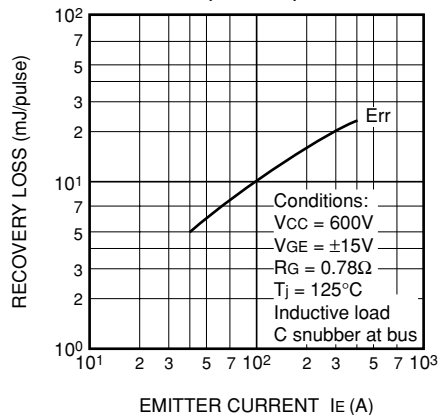
SWITCHING LOSS vs. COLLECTOR CURRENT (TYPICAL)



SWITCHING LOSS vs. GATE RESISTANCE (TYPICAL)



RECOVERY LOSS vs. Ie (TYPICAL)



RECOVERY LOSS vs. GATE RESISTANCE (TYPICAL)

